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I

TOPOGRAPHIC AND GEOLOGIC SURVEY OF PENNSYLVANIA

ADMINISTRATIVE REPORT

For June 1, 1930 to May 31, 1932

The Survey's job is getting and giving information on the State's mineral resources, their location, occurrence, character, value and use, and on its geology, topography, ground waters, soils, etc., to the end; first, that the largest and best use be made of these resources; second, to aid in the development of new industries; third, that unprofitable development or waste be avoided; fourth, that every citizen of the Commonwealth may, for the asking or the purchase of a report, learn what is under his land, where or how to obtain water, where to go for needed raw materials, or for the sale of materials found, and all other matters concerning the mineral resources of this State or elsewhere.

This information is gotten mainly by personal surveys, supplemented by drill records, maps and reports of private surveys by or for mining companies and others. The Survey employs only highly trained men, many of whom have had wide experience in their several lines of work in other states or countries.

Information is given through personal interviews in the Survey Office, over 1,000 a year; by answering letters of inquiry, about 6,000 a year; through the publication of maps and reports, over 7,000 pages published or in press in the last ten years, by articles in newspapers or technical journals, talks before associations or clubs, etc. This service enables the small land owner to get practically the same information regarding mineral deposits on or under his land as is held by corporations or persons who may approach him to lease or buy. It has saved the State millions of dollars by preventing unprofitable mining or drilling development. The Survey does not advise, it simply presents facts (except when an inquiry is made by other government departments). Inquiries range from those regarding sources of water supply, large or small, including many for State institutions, to the occurrence of rocks or minerals of certain characteristics needed by growing or new industries. Probably the bulk of the correspondence is with small land owners regarding the mineral values under their land. Of more importance to the State directly than all of these is the probable future service that the State will demand of the Survey in connection with the rehabilitation of the forest areas and many mineral areas of the State now on the decline. After the first cut of the forests or the mining of the thicker and cheaply-mined coal beds, many of the counties are faced with declining revenues, at a time when the demand is growing for better roads, schools and other public works. Under these conditions the State needs full and accurate knowledge of what is under the ground in order to plan its future. The State Geological Survey is the one source of this information. Unfortunately only one-third of the State has been studied in detail as yet. The continuation and completion of this detailed study forms the major project before the Survey.

At present and in the future the work of the Survey is and will be:

(1) Information service, as just mentioned, including the preparation and publication of reports. This with administration requires over one-fourth of the Survey's funds.

(2) Topographic mapping, started about 45 years ago, is now 83 per cent finished. It absorbs one-third of the Survey funds, and that amount is met by an equal amount furnished by the Federal Government.

(3) Detailed study and mapping of the State's geology and mineral resources, in cooperation with the Federal Government. (Publications, "Folios" of U.S. Geological Survey, "Atlas" and county reports of Pennsylvania Geologic Survey). Now given 12 per cent of Survey funds. This survey supplies the detailed information needed for an accurate knowledge of the mineral resources under the surface. To date only 34 per cent of the State has been studied in detail, and of this result about one-third is yet unpublished.

(4) Study of fundamental geology of State in order to understand and interpret findings in detailed studies; now given 8 per cent of Survey funds.

(5) State-wide study of individual mineral resources, now receiving 17 per cent of Survey funds.

(6) Ground water studies have covered a little more than one-half the State since 1925, using 3 per cent of Survey funds.

(7) The present Survey is well qualified in equipment and personnel to take over and carry out most of the projects suggested or started by the Greater Pennsylvania Council, relative to mineral resources. Indeed, much of the information needed for some of these studies is already on file with the Survey or is known to Survey members.

The present State Geologist has always considered that the State Geologic Survey was established for and existed only for the economic benefit of the State. Therefore, he and the geologists associated with him have always in their field studies given very close attention to the economic phases of the State's resources, recognizing from long experience the dominate part mining and transportation costs play in the financial success of any mining venture. They have, therefore, kept in close touch with markets, demands and prices, transportation costs, and mining costs, as determined by location, character, position, depth, and size of mineral deposits. A large part of their information service has been the frequent unpleasant duty of pointing out how greatly these costs for any particular deposit may exceed the market price of the commodity. Little of this material has been published because market conditions and prices fluctuate rapidly and new uses for old materials are constantly being discovered, so that figures published today may be misleading tomorrow.

The Survey is not prepared to take over Greater Pennsylvania Council projects involving strictly laboratory studies, except in an advisory or administrative way. It has been the Survey's policy from the start not to duplicate work or equipment already existing. Instead of establishing new laboratories of its own, it has, therefore, arranged to have necessary laboratory tests or studies made by existing laboratories, such as those at State College, and the other universities of the State, Mellon Institute, or by reliable private laboratories. It is believed that this has resulted in a considerable saving to the State and should be continued.

It has been suggested many times recently that the Survey could render a larger service if "mineral" or "mineral resources" appeared in the name so that the scope of its service would be better understood. Among many names suggested have been: "The Mineral Survey of Pennsylvania", "The Bureau of Geology and Mineral Resources", "The Topographic, Geologic and Mineral Resource Survey". My own preference would be for the second.

For further details of the methods of the Survey see the Administrative Report issued in 1931.

Work Report for 1930 - 1932.

Information. No count is kept of those calling at the office except now and then to check the number for a month or more. Such tests indicate that over

2000 persons came to the office for information. Letters received 14,186, answered *8,969. The State Geologist gave over 68 public addresses and several were given by other members of the Survey. Many press bulletins and articles describing the geology and mineral industries of Pennsylvania were written by members of the Survey and published in newspapers or technical magazines.

Publications. During the two years the following reports were completed and issued:

Topographic and Geologic Atlas of Pennsylvania, Lancaster Quadrangle, A. Jonas and G. W. Stose.
Administrative Report, G. H. Ashley.
Feldspar in Pennsylvania, R. W. Stone and H. H. Hughes.
Magnetite Deposits of French Creek, L. L. Smith.
Pennsylvania Caves, R. W. Stone.
Resources of Pennsylvania in a Nutshell, G. H. Ashley.
Syllabus of the Geology and Mineral Resources of Pennsylvania, G. H. Ashley.

The following reports were completed, edited, and were in press June 1, 1932, or have been issued since.

Geologic Map of Pennsylvania.
Oil and Gas Map of Pennsylvania, J. D. Sisler.
Topographic and Geologic Atlas of Pennsylvania, Freeport Quadrangle, H. H. Hughes.
Geology and Mineral Resources of Adams County, G. W. Stose.
Geology and Mineral Resources of Greene County, R. W. Stone.
Pennsylvania Caves, second edition, revised and enlarged, R. W. Stone.
Building Stones of Pennsylvania, R. W. Stone.
Ground water in Southwestern Pennsylvania, A. M. Piper.
Bituminous Coal Fields of Pennsylvania, Part II, second edition, J. D. Sisler.
Slate Deposits of Pennsylvania, C. H. Behre.
Clay and Shale Resources of Southwestern Pennsylvania, H. Leighton.
Meteorites Found in Pennsylvania, R. W. Stone.
Devonian Faunas of Pennsylvania, B. Willard.
Correlation of Ordovician Limestone at Salona, L. Whitcomb.

A voluminous report on the limestones of Pennsylvania by B. L. Miller was transmitted but returned for lack of printing funds. Also a report on the oil and gas fields of western Pennsylvania was completed but cannot be printed until additional funds are provided.

Several mimeograph bulletins have been issued, one of these on the Tioga Gas Field running through six editions.

Topography. During recent years preliminary control for topographic mapping has been pushed forward and now covers nearly all of the unmapped areas. During the two years, topographic mapping has been completed in the following quadrangles:

Broadtop
Loysville
Troy
Millville
Laporte
Warrensville
Starrucca

and the Eagles Mere and Tyrone quadrangles and all of Fayette County revised.

Engraved maps were completed and issued for eight quadrangles:

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*Out-going letters are fewer because many letters have been answered simply by mailing publications.

Eagles Mere
Townville
Snow Shoe
Union City
Karthaus
Ariel
Corry
Clearfield

In addition photoliths were made available for nine quadrangles:

Penfield
Titusville
Starrucca
Easton
Broadtop
Hyndman
Loysville
Warrensville
Tyrone

In the work now in progress on the Susquehanna, Genesee, Coudersport, and Smethport areas, advantage is being taken of airplane photographs made through a cooperative arrangement with the War Department and with the Curtis-Wright Company.

The financial statement beyond will show more than one-third of the Survey's budget spent for topography during 1930-1932. Anticipating that 1931 would see the bottom of the depression, with the Governor's approval, more than half ($35,000) of the funds allotted for topographic work ($50,000) were made available for use in 1931. Further, in the late winter of 1931-32, engineering societies made an appeal to the Governor in behalf of unemployed engineers, many of whom were being supported by their fellow engineers. To furnish work relief for the neediest cases, the Geological Survey made reductions in mahy of the other allocations for field work, and some of the cooperative geologic work was stopped, thus making available $3,000. This sum was duplicated by the Federal Survey and thirteen men were put to work on preliminary traverse and leveling work for a revision of the early topographic maps in the anthracite fields, for which requests have been urgent for some years.

General Geology. Finding that the detailed areal surveys were being retarded for lack of broad, regional, geologic studies necessary to an accurate interpretation of local conditions, this part of the Survey's work has been emphasized during the past few years. State-wide studies of the stratigraphy of the Silurian, Devonian, and Mississippian systems, whose rocks underlie a large part of Pennsylvania, have been under way with very gratifying results. The rocks of the three systems have an aggregate thickness of 15,000 feet or more and have never been carefully studied. Detailed investigations now in progress will require several years to finish, but have already thrown much light on the subject.

In addition a number of minor studies have been made seeking a better understanding of the geologic history of the surface of the State and of the gravel and other surface deposits. Incidental studies have led to a number of small reports, such as those on the caves and meteorites of Pennsylvania. In this work the Survey receives a large amount of voluntary help from geologic students and others.

Geology and Mineral Resources. Detailed Areal Mapping has been in progress on the Bradford, Brookville, Donegal, Confluence, Meyersdale, Hanover, and York quadrangles and on Fayette County, and some final work has been done on the Curwensville, Houtzdale, and New Cumberland quadrangles. It is anticipated that all of these projects will be finished during 1932-33 except that on the Donegal and Confluence quadrangles which will be about 40 per cent finished. The Lancaster Quadrangle Atlas has been issued and the Freeport Atlas is in press.

Working in cooperation, the U. S. Geological Survey has published geologic reports on the New Kensington, Quakertown, Doylestown, Coatesville and West Chester quadrangles, and has in press reports on the Somerset, Windber, Hollidaysburg, Huntingdon, Middletown quadrangles. Work is in progress or field work finished on the Zelienople, Butler, Reading, Boyertown, Slatington, Honeybrook, and Phoenixville quadrangles.

Several of these projects date back many years but publication has been delayed pending the solution of certain local problems which could be solved only by broad regional studies.

Special mention should be made of reports on the geology and mineral resources by counties. Reports on Adams County and on Greene County have recently come from the press, and one on Fayette County is in progress.

Mineral Resources. In the past the preponderance of inquiries regarding the mineral resources of the State, and the lack of up-to-date or even any information about many of them, led to giving a large place on the Survey's program to special studies of the several mineral resources. To the present, reconnaissance surveys have been made of the bituminous coal deposits, oil and gas deposits of western Pennsylvania, oil from coal and shale, glass sand deposits, silica refractories, molding sands, slate deposits, lead and zinc ores, iron ores, limestones, building stones, feldspar, and reports on these have been published, are in press, or await funds for printing. A detailed study of the magnetite at French Creek has been published, and another on the Bradford oil field awaits funds for publication. A good start has been made on the clays of the State, on the gas deposits of northern and eastern Pennsylvania. A detailed study of the deeper oil sands is in progress.

During the two years being reported on. work has been concentrated on completing studies of the oil and gas fields of western Pennsylvania, of the Bradford oil field, of the anticlines and synclines of northern Pennsylvania with reference to natural gas, and of the geology and mineral reserves of Fayette County. In addition work has been in progress on the classification of coal, with reference to pooling coals in the future, and on the use of coal. Incidental studies have been made on the sand and gravel deposits of the Scranton, Reading, nd Altoona regions, on flagstone, and on slate and greenstone granules.

The character and value of all of these studies is best revealed by a perusal of the reports already printed or soon to come from the press.

Ground water. In cooperation with the U. S. Geological Survey on a fifty-fifty basis, the only basis under the law upon which that Survey will do work of this kind, studies have been continued on the ground waters of the State. During the years involved, the ground water resources of twelve and a half counties in northeastern Pennsylvania have been studied. In 1931 a start was made in gaging wells all over the State, in order to have a better understanding of the relation of well-flow to rainfall. A report on the ground waters of southwestern Pennsylvania is in press.

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Financial Statement

Expenditures by Budget Sub-divisions

1930 - 1932

11.	Salaries	$ 71,710.42
12.	Wages	18,155.90
13.	Fees	67,724.25
31.	Travel	11,395.17
33.	Freight and express	46.31
34.	Postage	359.03
35.	Telegrams and telephone	39.83
	Total	$ 169,430.91

Expenditures by Projects or Service

General Operations		$ 42,935.86
Executive	$ 9,526.90	
Information service	19,607.16	
Publication	13,801.80	
Topographic mapping		64,020.00
Detailed mapping, geology, and mineral resources		14,757.17
General geology		15,259.67
Mineral resources		27,213.32
Coal	1,003.97	
Oil and gas	16,944.86	
Clay and clay testing	5,032.30	
Stone	1,143.64	
Limestone	2,122.50	
Miscellaneous	966.05	
Ground waters		5,244.89
Total		$ 169.430.91

II

BUDGET REVISIONS DURING 1932.

Two major revisions of the Survey Budget were made in 1932, the first in March to furnish work relief to unemployed engineers, the other to provide for the $15,000 cut in the Survey appropriation made in August by the Legislature in special session. The following table shows how these affected the several allotments, and the notes that follow explain more fully the effect on the work in progress or planned.

Changes in Geological Survey Allotments 1931-1933.

	First allot-ments	Changes in March	Revised Budget March	Changes in August	Revised Budget Sept. 1	Total net changes
Salaries	73,260	- 450	72,810	- 2,786	70,024	- 3,236
Field work, Hbg. office	8,775	- 1,625	7,150	- 446	6,704	- 2,071
Cooperative Geologists	13,390	- 3,925	9,465	- 401	9,064	- 4,326
Ground waters	4,000	0	4,000	- 1,079	2,921	- 1,079
Topography	50,000	+6,000	56,000	- 10,702	45,298	- 4,702
Office expense	575	0	575	+414	989	+414
	150,000		150,000	- 15,000	135,000	-15,000

The March changes were the result of requests to the Governor from the Engineering Societies that the State employ some of their members, then being supported by the societies, on topographic mapping. By trimming allotments for field work and cooperating geologists, $6,000 was made available ($3,000 to July 1, and $3,000 after July 1). That sum with an equal amount from the Federal Geological Survey gave employment to thirteen men doing preliminary traverse and level work in the anthracite region, for which there had been repeated requests. They have been paid $4 a day without expenses. The result of curtailing the other allotments was to shorten the field season of the regular staff, to stop a number of lines of work, such as, field studies and testing of clays, a study of the mineral resources of the Lehigh Region, a study of the deep oil sands of the State, etc. Several balances, estimated sufficient to complete projects nearly finished, were left intact.

In August the Legislature made a further cut of $15,000 or almost 33 per cent of the funds remaining September 1 ($46,284). To absorb this cut it was necessary to reduce field allotments still further and stop nearly all field work September 1, including the ground water survey being made in cooperation with the Federal Government, to stop several projects almost completed, such as, that on the Bradford Oil Field, on the mineral resources of Fayette County, and on the geology and mineral resources of the Brookville, Meyersdale, and New Cumberland quadrangles. Among projects stopped was the tracing and study of the anticlines of the northern Pennsylvania gas fields and several stratigraphic studies in progress on the Silurian, Devonian, and Mississippian rocks.

The relief work employing thirteen engineers was stopped and a heavy cut made in the regular allotment to topographic mapping. That cut, with the corresponding reduction of Federal funds, reduced the area that would have been covered by topographic parties in 1932 by about 430 square miles or an equivalent of an average county. In both the topographic and ground water work the State loses the results of an expenditure double the reduction of its own funds.

In order not to reduce the topographic work still further and to prevent losses in some of the work in hand that would have ensued had the work been stopped,

such as the well gaging started in 1931, the regular members of the Survey took voluntary salary cuts in the form of furloughs equivalent to an 8½ per cent reduction.

III

EXPLANATION OF PLANS AND ESTIMATED EXPENDITURES

For the Biennium 1933-1935 (See Form BB-1)

Introduction.

The Pennsylvania Geological Survey faces a door of golden opportunity if money can be found to permit it to enter. During 1930-32, it rendered signal service by giving information on gas conditions to land owners of northern Pennsylvania; for months answering over 50 letters and 3 callers a day on that subject. It issued 6 editions of Bulletin 102 on the Tioga gas field. Field work there was stopped by the Survey appropriation cut. Interest in that part of the State is still active and much field work remains to be done.

But looking to the future, with the past in mind, it needs no advertising that the coal industry of Pennsylvania, the backbone of the State's prosperity and industrial growth, has been slipping for years, with disastrous results to the State. From 1923 to 1929, the boom years, the value of Pennsylvania coal production decreased from $979,664,000 in 1923 to $644,250,000 in 1929, and employes from 352,724 in 1923 to 283,275 in 1929. Thousands of areas of coal lands have been turned back to the counties in lieu of taxes, and many coal-land counties face poverty, while their towns are being depopulated.

The first step toward economic recovery is to learn exactly the cause of this decline in production and values. Have the Southern States the advantage of better coals, lower wages, more efficient labor, better preparation, better salesmanship, lower freight rates, or what? How long will oil and natural gas push coal? Having determined the cause or causes of the decline, steps may be taken to remove or remedy as many of them as possible. If concerted action by the States involved is undertaken this State should have the facts as a basis of intelligent action.

It may then be found that Pennsylvania coal will have to make new markets close at home through the development of new industries in the coal fields, using local materials other than coal, and coal for power or chemical processes, taking advantage of present surplus labor, excellent transportation facilities, and nearness to large markets for manufactured goods.

Unfortunately, the coal industry is largely unorganized and prevented by Federal law from effective organization, but its prosperity is too vital to the State, and the coal counties especially, for the State not to render any assistance it can, if only as a "catalyzer", through the bringing together of facts.

The Survey occupies a key position for making these studies. For years it, and it alone of State organizations, has cooperated closely with all the Federal and State organizations and laboratories interested in this subject. It knows what they are doing, does not duplicate their work, but cooperates with them. Much of the Survey's effort and money has gone into cooperative projects, the State benefiting from the use of the highly trained personnel and expensive equipment of these other

organizations. Many of its publications show: "prepared in cooperation with _______________".

Second, the Survey has a highly trained and experienced personnel, most of whom have had a long and intimate acquaintance with the geology and mineral resources of Pennsylvania.

Third, the Survey library and files contain much published and unpublished information: To what preceding Surveys left it have been added thousands of well records or records of prospect drilling. It keeps in close touch with all of the improvements in prospecting mining methods, and improvements in uses.

The term "geologic" Survey has doubtless misled some people as to the scope of the Survey's activities. Some of its reports, however, such as M-4 and M-8 on Mining Losses and Mining Methods, or M-12 Anthracite Culm and Silt, or Report No. XII on Glass Manufacture and the Glass Sand Industry are indicative of this broader service.

Normally, in view of these facts, I should feel justified in asking for a greatly increased appropriation. In view of present conditions I am asking only for enough to enable the Survey to complete or continue projects now in hand, to undertake two new projects listed beyond, and to take advantage of Federal and other funds offered for work in this State.

I wish to make two definite recommendations: first, that the name of the Survey be changed to Bureau of Geology and Mineral Resources; second, that the wording of the code be amended to clearly cover cooperation with industrial organizations in helping to solve their problems.

Plans and Estimated Expenditures.

The work of the Survey falls into four major lines: (1) making a standard, accurate topographic map of the surface of the State; (2) making a corresponding standard and accurate map of the geology and mineral resources of the State with the necessary descriptive matter, with the accompanying and necessary general geology studies; (3) studies of the various mineral resources of the State to determine their location, depth, extent, character, and value, and the conditions affecting their successful exploitation and use; (4) executive work, classification and filing of incoming information or material, and information service, preparation of maps and reports for publication, classed together as General Operations. Expenditures for these four lines have usually been about in the ratio of 5:3:3:4.

The following table shows recent and proposed expenditures for these several items:

Table of project costs and estimates.

		Years 30 - 32		Bienn. 31-33		Bienn. 33-35	
		Items,	Totals	Items,	Totals	Items,	Totals
1	General operations		42,936		38,700		38,500
1a	Executive	9,527		9,700		9,500	
1b	Information service	19,607		16,000		17,000	
1c	Publication	13,802		13,000		12,000	
2	Topographic mapping		64,020		45,298		50,000
3	Geologic mapping		30,017		27,575		26,500
3a	General geology	15,260		13,850		11,500	
3b	Detailed mapping	14,757		13,725		15,000	
4	Mineral resources		27,213		20,506		30,000
4a	General report					2,750	
4b	Coal	1,004		850		8,500	
4c	Oil and gas	16,945		15,844		12,000	
4d	Clay	5,032		1,937		5,000	
4e	Stone	3,266		1,175		1,000	
4f	Miscellaneous	966		700		750	
5	Ground waters		5,245		2,921		5,000
			169,431		135,000		150,000

The lower figures for 1931-33 as compared with those of 1930-32 or with those requested result from the cut in the Survey appropriation at the Special Legislative Session in 1932, which abruptly stopped many of the Survey projects and shortened all field work.

1. General operations ($38,500). This work varies little from year to year.

1a. The executive work, includes planning, supervision, and inspection of the work; accounts, filing, postage, etc.

1b. Information service includes the collection, classifying, filing, etc. of information of all kinds; the giving of information in the office or by letter. It includes "Outside service" which refers to the preparation of informative articles, giving talks, etc; and "Cooperative service", or service rendered other government departments or bureaus. With a business revival, it is to be anticipated that inquiries in general will increase.

1c. Publication work, which covers typing manuscript, editing, proof reading, preparing illustrations, etc., may not be as heavy during the next two years as dur-

ing the present biennium.

2. Topographic mapping ($50,000). The making of a standard topographic map of the State has been in progress about 50 years and is now 83 per cent completed. The work is done in cooperation by the Federal Government on a 50-50 basis, and will stop if State cooperation stops. The topographic maps are too well known and too widely used to need comment. Engineers and others are asking that this work be hastened to completion. I am asking only for enough to continue the work on the old basis.

3. The geologic map of Pennsylvania ($26,500).

3b. The geologic map, like the topographic map, is a painstaking, careful job. Each unit, when completed, is intended to reveal all that can be learned from the surface, or from existing mining or drilling, about the geology and mineral resources of the area mapped; about 34 per cent completed. Present maps and reports, responding to the demand for higher standards, are more accurate and give more information regarding the mineral resources underlying the area, including tests of clay and shale, analyses and tests of coals, limestones and other rocks.

3a. Much of this greater accuracy is due to State-wide studies of the stratigraphy and structure of the rocks, carried on as special studies in General Geology.

4. Mineral resource studies ($30,000). During recent years attention has been concentrated mainly on oil and gas. Three large projects in this field have recently been completed; also, studies on slate, limestone, and building stone, and a progress report on clay and shale.

In lieu of these projects recently finished, I propose two projects long waiting for funds:

First (4a). The preparation of a concise but comprehensive picture of the mineral resources of the State as a whole and by counties.

Second (4b). A study of the coal industry of Pennsylvania to secure all of the facts possible that might be of service in seeking its rehabilitation. Your State Geologist has rubbed elbows with the coal industry of this and other States for 36 years. The Survey already has much of the necessary data.

The first study supplements the other by listing and describing local minerals other than coal for use as raw materials, for possible new industries.

4c. The oil and gas fields of northern Pennsylvania require much additional mapping.

4d. The work on clay and shale has only started.

4e and 4f. Further study of the flagstone industry is planned and contact with the building stone industry and the other mineral industries should be maintained.

5. Ground waters ($5,000). The results of the study of the ground waters of the State, carried on in cooperation with the Federal Government on a 50-50 basis, now one-half finished, is in growing demand.